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Electronic Business[®]

FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE

JANUARY 22, 1990

CHARTING A COURSE FOR THE '90s AT HEWLETT-PACKARD

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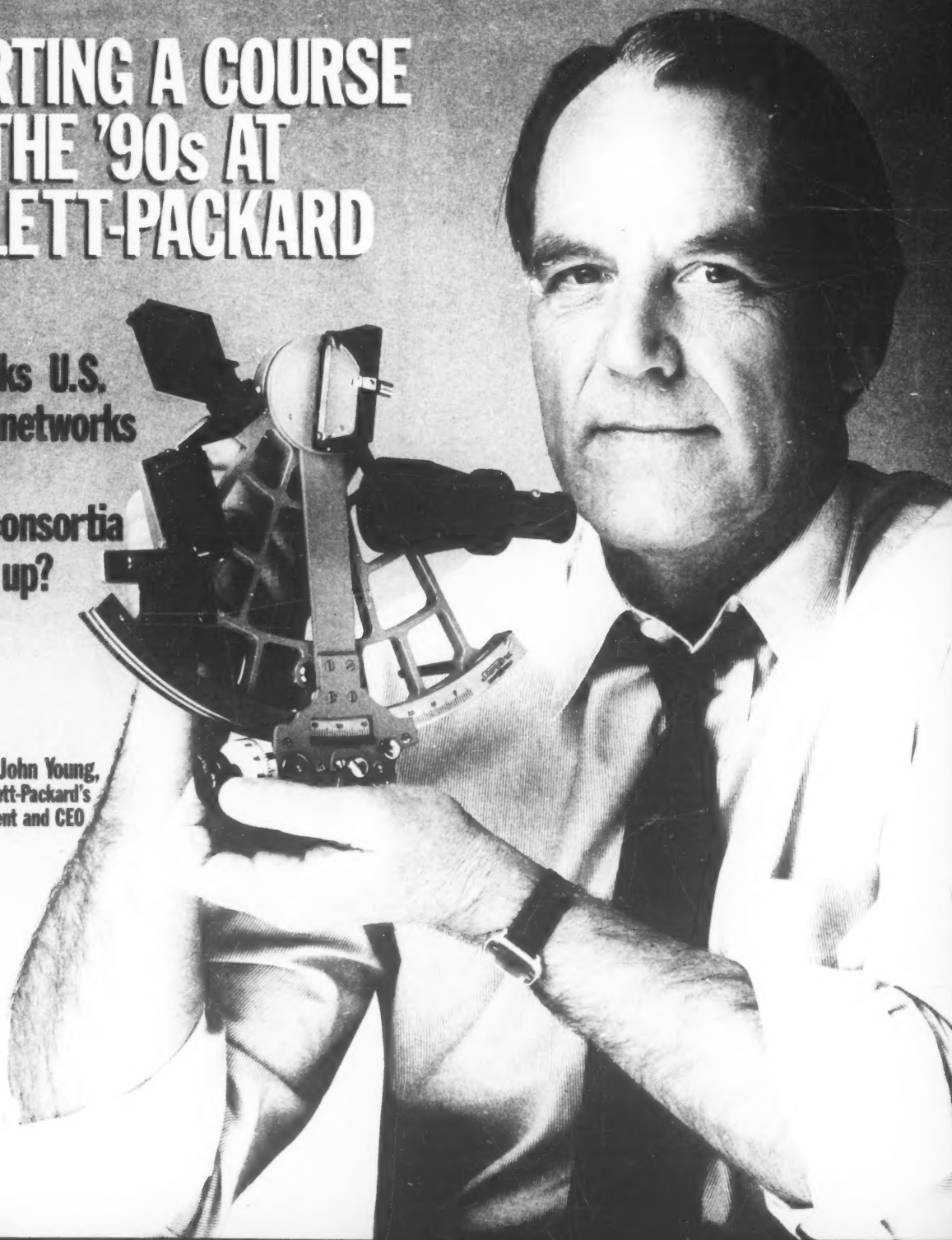
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**John Young,
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president and CEO**



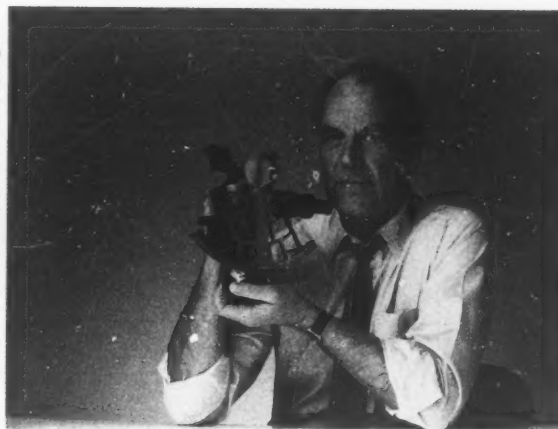
Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES — WORLDWIDE

VOL. 16, NO. 2

JANUARY 22, 1990

Cover photograph: Christopher Springmann



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After meeting its ambitious "10-times" growth goals in the 1980s, Hewlett-Packard has emerged from the decade deftly positioned. But it can't stop now. Like its competitors in the electronics industry, HP faces challenges in the 1990s of rapidly decreasing time-to-market and price/performance ratios, alternate distribution channels, lower margins and higher cost of sales. If HP can maintain its flexibility, it could become a truly dominant force in information technologies.

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Over the past 10 years, the Palo Alto, California-based company has become what many consider a first among equals in the ranks of successful, well-run electronics corporations. But like his competitors in the electronics industry, company president and CEO John Young faces challenges in the 1990s that may make the "10-times improvement" goals of the 1980s seem easy by comparison.

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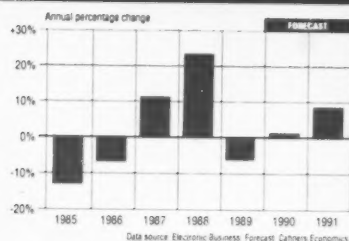


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Fast-changing telecom markets

One of the keys to the European Community's success in establishing a single market in 1992 will be a new and improved telecommunications industry. Europe's antiquated POTS, or plain old telephone service, as the current system is fondly called, must find its way to telecom heaven if 1992 is going to do what its visionaries plan.

In this issue's "Europe Business" section, Britain-based free-lance contributor Elaine Williams examines the dog-eat-dog competition kindled by the restructuring of the European telecommunications marketplace. Williams knows this subject intimately. A former staff writer and technology page editor for the *Financial Times* in London, she profiled two of Europe's major telecommunications players — Nokia of Finland and Ericsson of Sweden — for us last summer. In her current story, Williams notes that telecommunications is key to the single-market concept, because European businesses are thirsty for private data networks that link manufacturing, inventory and sales sites throughout the continent.

The promise of rebuilding the European telecommunications infrastructure has technologically superior U.S. companies, such as AT&T, Motorola and even the Baby Bells, chomping at the bit for some of the action.

Telecom coverage in this issue doesn't stop with Europe. We offer an examination of the fast-emerging Sonet standard for U.S. fiber-optic transmissions by contributing editor Dwight B. Davis, our chief writer on the telecommunications beat.

Davis, based in Boston, has written several key articles spanning our re-



Dwight Davis, contributing editor

cent 1990s issue as well as our time-to-market cover story last May. He has covered computers and telecommunications for more than 12 years for technology publications. He also coauthored a book, *Artificial Intelligence Enters the Marketplace*, published by Bantam.

A common standard for fiber-optic transmissions has been the missing element in the public telecommunications network, Davis writes. Sonet, or synchronous optical transmission, will meet that need by allowing carriers and third-party service providers to offer a broad range of enhanced communications services.

We believe both of these stories offer insight into fast-changing telecom markets that undoubtedly will be a focal point in the electronics industry through the 1990s.

MARVIN GREENE, section editor

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The missing links in the fiber-optics market

Equipment vendors eye high-growth market as a key standard emerges for fiber-optic telecom networks

For years, local and long-distance carriers have been ringing the changes on their growing use of high-capacity fiber-optic cable in the public telecommunications network. But even though carriers have installed hundreds of thousands of miles of optical cable, they couldn't take full advantage of their radiating lightwave infrastructure.

The missing element of communication: a common standard for fiber-optic transmissions.

Now all that's changing; at long last, a system-wide standard — dubbed "Sonet" for synchronous optical transmission — is fast emerging. Equipment suppliers are rushing to position themselves for what may be a multibillion dollar communications marketplace by the mid-1990s.

The market is likely to grow quickly because the public network carriers are eager to embrace the new ultrahigh-speed standard. Equipment built to the new standard should be less expensive than today's proprietary fiber-oriented products, thanks to improved economies of scale. Sonet also promises carriers radically increased transmission capacities, as well as greater control over their networks' management.

An installed Sonet infrastructure, in turn, will allow the carriers and third-party service providers to offer network users a broad range of enhanced communications services and exotic options. As such, carriers hope Sonet may serve as the linchpin in a strategy to lure back customers who have moved their communications traffic away from the public network and to suppliers of private "bypass" networks. Bypass vendors offer tailored local and long-distance communications links to businesses, using technologies that range from fiber optics to microwaves to satellites.

The fundamental concept for Sonet was proposed several years ago by Bell Communications Research (Bellcore), the research and development arm of the seven regional Bell

operating companies (RBOCs). Detailed Sonet specifications are still being hammered out by the American National Standards Institute (ANSI), which is introducing the standard in phases.

Phase 1 was published in March 1988 and Phase 2 is scheduled for completion in February. Phase 2 was meant to be the final Sonet specification, but continuing difficulties in resolving certain aspects of the standard could force the ratification process into a third phase, says Steve Sazegari, senior telecommunications industry analyst for Dataquest Inc.

Network equipment vendors are not waiting for the final standards resolution, though. A few, including Fujitsu America Inc., Alcatel Network Systems Corp./Transcom and Optilink Corp., announced Phase 1-compatible Sonet products in late 1988 or early 1989. Sonet gained full market legitimacy this fall when AT&T Network Systems — the dominant supplier to the U.S. public

network — and Northern Telecom Inc. announced their own Sonet products.

The stakes in the Sonet marketplace are high. U.S. carrier (local and long-distance) expenditures on switching and transmission equipment total about \$12 billion per year, according to Ray Ritchie, division manager for network transport requirements at Bellcore. About \$4 billion of that total is subject to capture by Sonet-based equipment, he estimates.

The local Bell operating companies (BOCs) account for about \$2 billion of the \$4 billion total, Ritchie says. "By 1993 to 1994, almost 100% of the new equipment installed by the BOCs will be Sonet-compatible [where applicable]," he predicts.

While Sonet has been broadly embraced by North American telecommunications vendors, Dataquest's Sazegari notes that customers such as the BOCs — despite their enthusiasm for the Sonet concept — generally are unwilling to place large Sonet equipment orders until the standard firms up.

"There is a general industry concern that the shift over to Phase 2 standards may require hardware modifications or be costly," he says. AT&T Network Systems — which already claims Phase 2 compatibility for its Sonet products — is doing its



Barrett Robb, manager of transmission product planning for AT&T Network Systems: Sonet will make international connectivity and operations more convenient

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best to raise such concerns.

"We expect that hardware changes will be required to upgrade to Phase 2, although we can't guarantee it," says David Howells, product planning manager for the Transmission Business Unit of AT&T Network Systems. Barrett Robb, manager of transmission product planning for the same unit, warns, "There is a significant risk involved in the upgrade from Phase 1 to Phase 2."

Steve Rogers, director for market development at Northern Telecom, counters, "We launched a hardware platform that is completely Phase 1 compatible and put everything that is Phase 2 affected into software." Until the Phase 2 specifications are published, he says, no company, including AT&T, can claim that its products adhere to those standards.

Phase 2 compatibility is important because it is those specifications that are intended to provide for multivendor equipment compatibility. Even with the standard in place, however, variations in vendor implementations may still exist. As a result, the success of multivendor compatibility won't really be known until customers actually begin testing mixtures of equipment, says Dan Meessmann, vice president for sales and marketing at Alcatel.

In the meantime, "Alcatel products are involved in trials at virtually all of the operating companies," Meessmann says. Alcatel, which has the broadest Sonet family of products currently available for shipment, holds claim as the first supplier to place such equipment in everyday domestic operation — via contracts with United Telephone Company of Indiana and Central Telephone Company of Virginia.

For its part, Fujitsu announced in late November a "two-year multimillion dollar contract" with Bell Atlantic Network Services Inc. to provide Sonet equipment to the four Bell Atlantic BOCs. "It's very encouraging to have Bell Atlantic endorse a Fujitsu product since we believe it will help open doors into the other regions," says Mehmet Balos, director of marketing for Fujitsu America's Transmission Division.

The BOCs and other public network carriers have a number of incentives to install Sonet equipment beyond the benefit of achieving inter-vendor connectivity. Among these is

the fact that Sonet has been adopted as a worldwide telecom standard. This will also reduce equipment prices, thanks to the manufacturing economies of scale possible, notes AT&T's Robb.

The most obvious Sonet incentive is the boost in transmission capacity the fiber-optic standard will permit. Electrical transmissions face certain physical limitations. "It's not practical to handle much over 150 megabits per second [Mbps] over an electrical interface link," explains Bellcore's Ritchie.

Sonet offers carriers high transmission rates as well as improved network management

"Fiber optics, by contrast, allow you to go up in transmission capacity almost without bound," he says. Sonet takes advantage of this potential by offering a basic transmission rate of 51.84 Mbps and a maximum rate of 2.48 gigabits per second (48 times the basic rate).

As a result, notes H. Paris Burstyn, director of telecommunications research and consulting at the Business Research Group, "Carriers can upgrade a fiber link's capacity merely by changing the electronics at each end of the link." Achieving equivalent capacity boosts in a copper-

based network could require the installation of new copper lines as well as associated transmission equipment changes, he points out.

In addition to high-capacity transmission, Sonet offers the carriers a feature of potentially greater importance. Sonet groups information to be transmitted ("payload") in blocks that also include a section for "overhead" data. The overhead section includes a data communications channel and permits the carriers to implement sophisticated network management and control operations known as operations, administration, maintenance and provisioning, or OAM&P, in networking parlance.

It is via Sonet's OAM&P functions that network users may see their first benefits from the standard. One change will be improved network reliability and survivability. More direct user benefits could include rapid provisioning of requested lines and dynamic bandwidth allocation.

"Today, it can take weeks or months following an order to receive a new digital circuit," says Ritchie at Bellcore. "With Sonet's rapid provisioning capacity, that time could drop to days, hours or even minutes."

"With dynamic bandwidth allocation," he continues, "you could simply dial up whatever transmission capacity you need, and then release it when you don't need it any longer." Corporate users could thereby avoid paying for excess leased-line capacity that sits idle much of the time.

For the public network carriers, the ability to provide high-speed optical transmission and the attendant services over their lines will improve their competitive stance against the private bypass networks that have drawn corporate users away from the public network in recent years. The growing complexity and mixture of information transmitted over the networks may assist the carriers in this regard, believes Martyn Roetter, director of information systems and telecommunications consulting at Arthur D. Little.

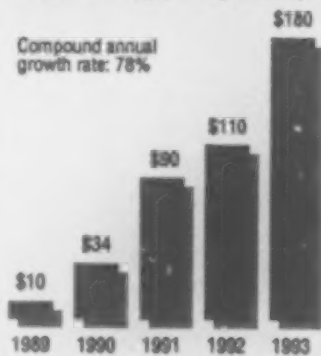
"It will be almost impossible to build private networks that can handle future network complexity," he says. Because the Sonet-based public network will have that capacity, "it might help the pendulum swing back toward the public network and away from the bypass vendors."

DWIGHT B. DAVIS

Sonet standard emerges

Projected U.S. sales of Sonet-compatible transmission equipment (\$ millions)

Compound annual growth rate: 78%



Source: Northern Business Information

Workstations, PCs fight over the middle ground

As workstation vendors move down into PC markets, PC suppliers are retaliating with their own high-end micros

The already blurry boundary separating workstations and personal computers has become even fuzzier in recent months.

Workstation vendors are unleashing a wave of new systems dubbed "personal workstations" in an effort to muscle in on market turf traditionally held by personal computer suppliers. But PC vendors aren't sitting still. They have begun to push new high-end microcomputers, based on Intel Corp.'s 80486 microprocessor, into CAD/CAM and other markets long the domain of workstations.

The workstation-versus-personal computer debate is more than a matter of semantics. Forecasts compiled by the InfoCorp market research firm show that the market for desktop systems in the \$3,000 to \$25,000 price range, including both personal computers and workstations, will grow from \$40.1 billion this year to \$130.5 billion by 1996.

The major workstation suppliers, Hewlett-Packard Co., Digital Equipment Corp. and Sun Microsystems Inc., all have fielded computers that can be considered personal workstations. Digital's DEC station 2100, Hewlett-Packard's HP9000 Series Model 345 and Sun's SPARCstation1 all have starting prices in the \$8,000 to \$10,000 range.

Reminiscent of the PC market, there is even a growing number of workstation "clones." Solbourne Computer Inc., Longmont, Colo., and Tatung Company of America Inc., Long Beach, Calif., both market Sun-compatible workstations.

"This is the next wave of computing, the personal workstation," boasted Anthony G. Bozzini, worldwide sales and marketing director for Fujitsu Microelectronics Inc.'s Ad-

vanced Products Division in San Jose. At the Fall Comdex show last November, Fujitsu Microelectronics unveiled a blueprint for a Sun-compatible reduced instruction set computer (RISC) personal workstation which it will license to prospective manufacturers.

At the same show, personal computer suppliers ranging from giants Compaq Computer Corp. and AST Research Inc. to tiny EasyData Computer Products and Hims Technologies Inc. were showing off 486 microcomputers running CAD/CAM and other engineering applications. Everex Systems Inc. claims that its new Step 486is microcomputer outperforms Sun's SPARCstation1.

"We're seeing a lot of 486 systems sold as servers and for engineering and CAD/CAM applications," said EasyData marketing director James D. Meyer, while watching the company's Model 425 microcomputer draw engineering designs at Comdex. "Our engineers use Sun workstations, but we've found that this 486 system is four times more powerful." EasyData, of Mountain View, Calif.,

is a division of Taiwan-based GCH Systems Inc.

While the claim of a personal computer "four times more powerful" than a workstation might be dismissed as hype, there is no doubt that the two are getting closer in terms of raw power. Personal workstations offer performance in the range of 10 to 15 million instructions per second, while the new generation of 486-based microcomputers operate in the vicinity of 8 MIPS, making the latter competitive in markets long held by workstations. Both sides, not surprisingly, claim superior price/performance for their products.

A key to Fujitsu's strategy of pitting its workstation design against personal computers is the SoftPC program from Insignia Solutions Inc., of Sunnyvale, Calif. SoftPC allows a workstation to emulate the functions of an IBM personal computer based on Intel microprocessors. That gives the workstation the ability to run the same DOS applications, estimated to number around 50,000, as most personal computers.

But PC vendors have been using the emulation strategy for some time. Software from The Santa Cruz Operation Inc. and Interactive Systems Corp. allow their microcomputers to run Unix applications usually relegated to the workstation world.

Efforts by personal computer vendors to crash the workstation party have been further boosted by Intel's plan to sell prepackaged versions of Unix System V for 386 and 486 computers in an effort to increase sales of those systems in the Unix arena. According to statistics from market research firm International Data Corp., Intel already claims that 57% of all Unix-based computers use Intel microprocessors.

The desire of personal computer suppliers to grab market share within the Unix arena is not surprising. A study, conducted by IDC and the investment research firm Sanford C. Bernstein & Co. Inc., concluded that by 1993 over 40% of all desktop systems shipped every year will be Unix-based.

RICK WHITING

Personal workstation pizzazz

Projected worldwide shipments for desktop systems, including personal computers and workstations, in the \$3,000 to \$25,000 price range (\$ billions)



Source: InfoCorp

Europe's telecom markets are opening up for business

As the EC builds the infrastructure for 1992, competition-stifling telecommunications monopolies are falling by the wayside, giving outsiders a chance for some action

BY ELAINE WILLIAMS

Constraints to competition in the European telecommunications industry have been collapsing almost as fast as some sections of the Berlin Wall.

But the biggest barriers will come down this April, when the European Community (EC) officially removes the monopolies held by the government-controlled post and telecommunications authorities (PTTs), whose tight grip has hindered successful cross-border competition.

As Europe hurries to build the infrastructure for 1992, the market for digital switches, mobile and data-communications, and services is shaping up as the world's fastest growing. There's ample room for change. Europe's antique telephone systems are fondly called POTS, for plain old telephone service. Absent so far are pan-European services that can network or integrate voice and data transmission — all key features for businesses that are gearing up to sell to a unified European market.

"What should not be forgotten is that we are in a period of unprecedented change and considerable deregulation," says Ted Richardson, a telecommunications analyst with Dataquest Europe in London. "The industry in Europe will go through greater change in the next five years than it has in the past 50."

Poised to profit

Poised to profit are the U.S. companies with superb telecommunications technology and a head start in competing in a deregulated market. AT&T, Northern Telecom Ltd., Motorola Inc., Nynex Co., General Motors Corp.'s Electronic Data Systems Corp. (EDS) division, BellSouth Corp., US West Inc., Pacific Bell and the other Baby Bells are preparing for the first major breach in the defenses

of the European telecommunications market.

European businesses are thirsty for the data and value-added services that were previously tied to PTTs, often at monopolistic prices more than 80% higher than in the United States. Private data networks are essential for linking manufacturing, inventory and sales sites scattered around Europe. As companies gear up to treat Europe as one market, it's all the more important to link data across national boundaries.

Until now PTTs set the rules of the game by buying as much as 80% of the telecommunications equipment in some countries. Much of that business went to local suppliers, because foreign vendors had no incentive to sell in other countries with widely varying regulations and technical standards. Protectionist policies and restrictive certification created added barriers to cross-border tele-

communications.

But now EC figures suggest that telecommunications will grow from about 3% of the EC's gross domestic product to 7% by the year 2000. Already the EC accounts for 25% of the world market of about \$412 billion. And it will spend more: Italy's PTT, for example, is planning a \$27 billion investment over the next four years to upgrade its outdated and inefficient telephone network.

Expected growth

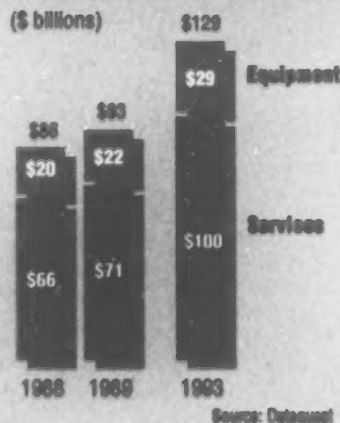
The European telecommunications market will grow 8.5% annually over the next four years, according to recently released Dataquest figures. Revenue from services in Europe will be \$100 billion and from equipment \$29.3 billion by 1993. On-site customer equipment such as telephones, fax machines and telexes represent about 24% of the EC equipment market. Transmission equipment is 13%, while the central office equipment market for switches is around 47%, according to the EC.

Britain is the largest single European market at 18.5% of the total. West Germany represents 17.8%, France 16.2%, Italy 14.2%, Sweden 5.2%, Spain 3.9% and the Netherlands 3.3%. The remaining 20.9% is spread across the other 19 Western European countries covered by the Council of European Post and Telecommunications (CEPT).

To achieve its ambitions of a single market, the EC recognizes it is vital to lay down a modern infrastructure first. It is coordinating pan-European standards for the first time. Nationalistic buying policies will supposedly be swept away by the single market, creating a wealth of opportunities for suppliers.

Dismantling the PTTs is no easy task, though. Those EC countries with liberalized telecommunications

Europe's fast growing telecommunications market



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markets, led by Britain, are wrangling with the more monopolistic PTTs that earn 90% of their revenue from basic voice service, public data networks and private circuits. Their main weapon in opening up these government-run monopolies is an EC directive that can force member states into accepting nonrestrictive markets for value-added data networks.

Previously seven different public telecommunications systems operated within Europe, a situation that has hampered cross-border communications, boosted costs for end users and held back suppliers from learning the competitive skills they'll need to succeed in world markets. Governments introduced competition to only a few markets so far — such as Britain, which deregulated five years ago, and the Netherlands, which liberalized its market for equipment and most services last year.

The U.S. companies entering Europe are focusing on emerging markets: cellular, private branch exchange and local area network integration, video conferencing, cordless telephones, Integrated Services Digital Network (ISDN) and voice messaging. The result is a rash of joint ventures, acquisitions and consortia to bid for strategic openings in these markets.

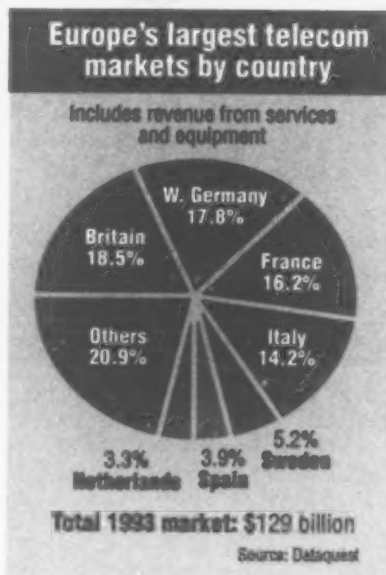
"Europeans have the opportunity for a lead in digital, cellular and cordless technology," Dataquest's Richardson says, "but without a doubt there are additional opportunities for non-Europeans in these areas and other merging markets."

To sell its digital switches and other products in Europe, AT&T last year bought a 20% stake in Italtel, the Italian telecommunications supplier. AT&T also announced the \$280 million acquisition of Istel Ltd., a British information services company that will give AT&T access to private data networks.

Multiple standards a headache

Building new private digital transmission networks across Europe is a headache for businesses, because standards vary so widely among countries. Therein lies the opportunity for established players in data networking.

General Electric Information Services Co., a subsidiary of the U.S.'s General Electric Co., offers a range



of applications and value-added services by managing private data networks in Europe. GM's EDS builds networks for Electronic Data Interchange (EDI) and other data services. Infonet is a data network supplier controlled by Computer Sciences Corp. in the United States, but its shares are also held by seven European PTTs. Other possible vendors with private network capability are Digital Equipment Corp. and US Sprint, which owns the Telenet Inter-

Poised to profit are U.S. companies with superb technology and used to deregulation

national data network.

Another European market set to take off is public switches, which form the core of the new digital networks now being installed to replace analog systems. The number of digital telephone lines installed yearly in Europe will rise by 12% by 1991, Dataquest predicts, compared with a 2.6% increase in the United States.

AT&T and Northern Telecom are the two non-European companies with the best crack at the \$5 billion market for digital switches that Dataquest predicts will exist by 1992.

Northern Telecom has tried to show its face in Europe by investing more than \$76 million in marketing, manufacturing and R&D facilities in Britain and to a smaller extent in France and West Germany. So far, that's had very little effect, says Dennis Exton, an analyst with Merrill Lynch Europe Ltd. in London.

Northern Telecom has won a few orders for private packet switching equipment from British Telecommunications plc (BT) and its British rival Cable & Wireless plc, but so far the big orders have been elusive. Last June, Northern Telecom sold its first DMS 300 digital exchange to BT for \$4.7 million. But the company still sells less than 3 million digital lines annually, Exton says.

Northern Telecom has a manufacturing license agreement with Britain's General Electric Co. to make its digital switch. But because of GEC's link to West Germany's Siemens AG, another maker of digital switches, it is likely that it will use Siemens' technology in the future, Exton speculates. Siemens and GEC jointly own equipment maker GPT Ltd., formerly GEC Plessey Telecommunications plc.

The European suppliers of public switches have gone through dramatic changes of late. Of the 10 major switch makers doing business five years ago, only three still dominate the market: Siemens, Sweden's LM Ericsson and France's Alcatel. All are branching out from their home territories.

In November, Alcatel and Siemens announced a nonproprietary joint common specification for an ISDN signaling protocol to be used in private networks. The move should be significant in accelerating the decision by three European regulatory bodies to set standards for open multivendor systems by the mid-1990s. The two companies are negotiating with other vendors, including equipment maker GPT Ltd., in which Siemens has a 40% partnership stake.

Wanted: Competition

Customers locked into the proprietary products of the two market leaders prompted the cooperative effort by asking for an ISDN product with multivendor capability. "They want competition," says Dietrich Arbenz, senior director of systems planning with Siemens' Private Communica-

Loosening the grip of the PTTs

It was in June 1989 that Sir Leon Brittain, vice president of the Council of Ministers in the European Community, underlined the importance of the telecom industry.

"Telecommunications is a sector of great political and technological complexity, fundamental to Europe's economy and of great importance to all its citizens," he said.

The EC's Article 90 directive, which goes into force in April, includes a three-point plan for telecommunications:

- To produce a 40% liberalization of public procurement (after 1992 there will be 100% deregulation);
- To create a European Telecommunications Standards Institute to accelerate the formation of standards and technical specifications and to ease certification; and
- To remove regulatory and standard-setting power from the PTTs.

Before the directive took effect,

some countries had already loosened the PTT's grip on the home market. Britain was the first to do so when it privatized its national PTT five years ago, during the height of the Thatcher government's privatization fever. The government allowed competition in the shape of Mercury Communications Ltd. owned by Cable & Wireless plc.

More recently, the Dutch PTT headed into the private sector. It is now called PTT Nederland. The West German PTT was restructured, with legislation to liberalize some services in 1990. France still is working out how it can restructure to meet the Article 90 directive. French telecommunications authorities have objected to the use of Article 90, under which the Council of the European Community can impose a law that affects individual countries without getting approval from the national legislative body first. □

tion Systems Group.

In public switching, the stakes are high. It costs companies about \$1 billion to develop their switching systems, which means "if you don't sell it, it can kill you," Ericsson vice president Carl Henrik Ström warns. With technology rapidly changing and requiring greater levels of investment than many development budgets allow, according to Ström, "the question is whether you can get a return on your system before you have to upgrade or radically change it."

Ericsson has about a 40% share of the European infrastructure market for cellular communications. The company supplies phones to one of the consortia operating the two cellular networks in Britain, which has Europe's most highly developed cellular market. Britain was liberated from its state monopoly five years ago when BT went public, blazing the trail for the rest of Europe. "The United Kingdom has been a godsend to overseas suppliers who needed to get a foothold in Europe," Merrill Lynch's Exton says.

Both of the consortia operating Britain's networks have U.S. members. Nynex has a 16% share in Cell-

net, which is majority owned by BT, while Motorola is building most of Cellnet's \$750 million infrastructure. BellSouth has a stake in Vodaphone, the competing cellular network controlled by Racal Telecom plc.

Mobile network licensing

Licensing for mobile networks is still a tricky business, with a certain amount of politicking in the ranks, points out Ian Cox, consultant with the British market research company NZA. In the licensing process, consortia are allowed to bid for only a limited number of mobile network licenses in each country. Most consortia have a local champion for their cause. "You have to understand the local culture," Ericsson's Ström says. "You can't go in there and grab. . . . There will always be a local champion, and you will be fighting it."

Competition to scramble for licenses is fierce. Equipment vendors are effectively shut out of the market once a country awards a license to the winning consortium. With Europe's booming demand for telecommunications, that chance is one that equipment vendors can ill afford. □

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Power-packed portables are storming PC markets

A whirlwind of portable computers of all sizes and shapes is sweeping through the industry. Is it a true weather change, or only a tempest in a laptop?

BY PETER BURROWS

A storm is brewing in the portable computer industry.

Once dominated by a handful of thriving computer giants, the market for battery-powered transportable, laptop, notebook and now pocket-sized computers has been rocked in recent months by a torrent of new niches, strategies and competitors cutting a swath across old market structures.

Feeding the storm is a swirl of technical breakthroughs and rising signs that the future shape of personal computers is getting smaller.

From one pound DOS-compatible curios that fit in breast pockets to 386-based powerhouses that match desktop functionality step for step, technology has finally granted portable computer users a level of utility for which they have always yearned. In the 1980s, even the best-selling models were too heavy, unwieldy, fragile, slow or weak on battery life.

But as we enter the 1990s, portables are ready to take the world by storm.

"These are now productivity machines, and they've been legitimized almost as a replacement for desktop [computers]," says JoAnn Stahel, president of Dallas-based Storeboard Inc., a research group. "People figured the laptop market would take off a few years ago, but we're on the brink of watching this business really skyrocket."

Battery-powered machines already are the fastest growing segment of the PC market, analysts report. U.S. sales of portables in 1989 will be about \$1.65 billion, up from \$420 million in 1986, quotes New York-based Link Resources, a market research firm. By 1993, this market could be worth up to \$6.3 billion, according to market researcher Dataquest Inc.

World markets should see similar growth. With \$3.5 billion sold worldwide in 1989, portables currently

make up 5.6% of all personal computers sold, Dataquest reports; by 1993, the market should expand to \$11.6 billion, for a 10.6% share of total personal computer sales. The U.S. market currently accounts for 63% of the world demand for portables, with Western Europe at 17% and Japan at 14%, according to Framingham, Massachusetts-based International Data Group, a market research firm.

Newcomers galore

A host of newcomers has been streaming in to get a piece of the action. From only a handful of players as recently as 1986, there are now 38 manufacturers of battery-powered computers, says Alan Zeichick, a senior editor with *Portable Computing* magazine in Manchester, N.H. This year, Apple Computer Inc., Dell Computer Corp., Dyna Computer Inc., Leading Edge Hardware Products Inc., Packard Bell, Poet Computer Corp., Psion Inc., Tandon Corp., Texas Instruments Inc. and a cadre of lesser known start-ups are all introducing laptop computers.

"It's an expansion market," says Laurie Strong, director of product marketing for Compaq Computer Corp. "People who weren't willing to carry one around before are getting interested now... and price is not the No. 1 issue with the majority of them."

From Compaq's perspective, the portable computer market must look endless. After watching Zenith Data Systems Corp. and Toshiba America Inc. trade market leader status through the latter part of the 1980s, Compaq entered the fray with its SLT/286 laptop in late 1988. Featuring the world's first portable VGA display, a detachable keyboard and

slick design, the SLT accounted for almost 40% of the battery-powered laptops available through U.S. dealers by the end of last year, according to Storeboard Inc.

Compaq was sixth in market share in 1988 with a 6.7% share of the \$2 billion market, according to Dataquest. Last fall the company introduced its LTE-series "notebook" sized computers. Although expensive, these models are the only notebook class computers equipped with a hard drive and standard-sized 3.5-inch floppy disk drive. Spurred by sales of the LTE, Compaq's sales were expected to double in 1989, predicted analysts.

Some predicted the company would be market leader by year's end.

But for other companies, the portable PC business is fast beginning to resemble the more competitive and mature segments of the electronics industry. Fears of falling margins helped convince Zenith Electronics Corp. to sell its computer division rather than its consumer electronics division last October, even though the former had posted better financial numbers for years. In the proxy for the sale, the company cited "increasing competition, narrowing margins" and "increased advertising and promotion



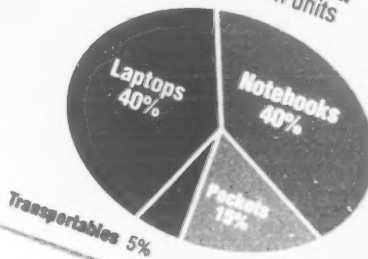
U.S. portable PC market: A shift in the wind

Total 1989 market:
1.4 million units



Source: Creative Strategies Research

Total 1992 market:
3.2 million units



Ken Condon

MARKET PERSPECTIVES

COMPUTERS

costs" as contributing factors.

The breakneck pace of technological development may be the biggest obstacle to success in this market. Within five years, most manufacturers will boast portables with VGA color displays, VLSI architecture, cellular phone links and battery lives of eight to 10 hours. These advances in miniaturization, power management and display technology make for high R&D costs, but experience shows that customers are willing to pay a premium for truly functional portables. In this market, products not at the cutting edge quickly lose their appeal, especially since most newer generation models are being priced competitively with their clunkier forerunners.

"The evolution has been toward more features for the dollar," says IDG's Bruce Stevens. "Three years ago \$3,000 would get you a crappy screen and a floppy disk. Now it'll get you VGA quality and a 20MB hard drive."

This steady increase in the dollar value of portable computers is sure to keep market growth on the fast track, but it drastically shortens product life cycles. Already, inventories of formerly successful models such as NEC Corp.'s MultiSpeed laptop and Tandy Corp.'s Model 1400 are being closed out at cut-rate prices at retail locations around the country as more advanced machines come to market. Until recently, IBM was selling off the last of its PC-Convertibles on cable TV.

Redefining portability

Of the technical breakthroughs, the Lilliputian feats of Poqet Computer Corp. of Mountain View, Calif., stand out. With 50 power management patents to their engineers' credit, the company has introduced a one pound pocket computer that runs on less power than the average Christmas tree light and can last for up to 100 hours on two AA batteries, claims marketing manager Gerry Purdy.

The company, which is 38% owned by Fujitsu Ltd. of Japan, expects to sell 100,000 units and be profitable in 1990, says Purdy. Seven authorized dealers and over 380 resellers have signed up to sell the unit for a hefty \$1,995.

But while many expect the pocket class of computers to revolutionize

personal computing, others are doubtful. "Pocket computers are overblown calculators," says Geena Carter, director of microcomputer marketing for Zenith, of the Poqet. "If you're not under a \$1,000 price point, you're in for trouble." Adds IDG's Stevens, "It's not whether it fits in your pocket that's important. It's whether it fits in your briefcase."

Notebook computers fall into this

The portable PC business is fast beginning to resemble the more competitive and mature segments of the electronics industry

category. Comprised of models weighing six pounds or less, the notebook computer is shaping up as the next hot market. Both NEC Home Electronics Inc., now part of NEC Technologies Inc., and Zenith Data Systems introduced notebook models in 1988; as of January of this year, Compaq, Tandy, Toshiba America, Texas Instruments and Psion have all introduced models. "These are the future of portable computing," according to Bill Lempesis, a senior analyst with Dataquest.

"The guys who are going to win in this business are the people capable of stuffing 10 pounds of sand into a five-pound box," says Keith R. Lobo, CEO of Chips and Technologies Inc., a supplier of chipsets for portable computers. "Essentially, three years from now consumers will have the computing power of five VAXs from about two years ago in their briefcases as they walk around."

The flip side of the miniaturization craze is the slow death of the trans-portable — or "luggable" — computer. Sales of these 18-pound-plus machines sold in the nation's computer stores through the first three quarters of 1989 did increase 19.4% over 1988, Storeboard reports. But laptop sales increased 92.3% during the same period.

Enough market for all?

Despite the exploding demand for portables, some observers worry that there won't be enough market share to go around. "All these guys are getting in because they think of this as a huge market," says IDG's Stevens, "but it's actually a niche that is growing into a canyon." Stevens predicts an oversupply by year's end, despite a 30% increase in demand for portable products. "The market is definitely expanding, but too many people are getting into the act."

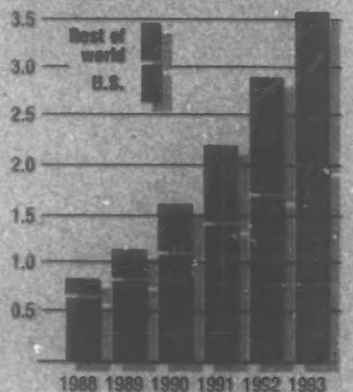
"1990 will be a tough year," says Lempesis. "Lots of people will be introducing machines for \$2,000 or \$3,000 less [than current models], and plenty of people will pay attention."

Marketing directors of the major players are not feeling the heat yet. But the full effect of competition has yet to be felt. "Eventually portables will be a commodity market, just like desktops — maybe even more so," says Lempesis. Prices already are coming down. NEC and Zenith have reduced prices by up to 40%. Sanyo Inc. reduced prices on its low-end models by \$200 last July.

Veterans of portable PC marketing say the price cuts are the result of lower prices from component vendors who are enjoying ever higher volumes due to all the new entries. Displays that cost thousands of dollars a year and a half ago now cost a few hundred; VLSI chipsets are now being sold for the same price as their less-sophisticated LSI predecessors. "Volume is going up and component

Lightning fast growth for portable PCs

Worldwide unit shipments of battery-operated portables (billions)



Source: Dataquest Inc.

costs are going down," says Ed Juge, director of marketing and planning for Tandy. "It's not the competitive pressure."

In truth, most of the market leaders never contend head-on with their lower shelf rivals. Players like Compaq, NEC, Tandy and Toshiba have all but monopolized the shelf space of the computer dealers and retail stores; Zenith and Grid Systems Corp., a Tandy subsidiary, have extensive direct sales programs. Most of the newcomers, however, are waging a battle royal for consumer and non-*Fortune* 1,000 customers through other distribution channels. Warehouse clubs and cable TV home-shopping programs are all springing up to serve mass markets.

Mass merchandisers feel they have a crucial advantage with portables. Customers need help in configuring desktop models for their particular needs, "but laptops come fully configured," says Dan Shaffer, vice president of marketing for Bondwell Industrial Inc. of Fremont, Calif. "There aren't a lot of options to worry about."

No place for the little guy?

Despite growing demand for laptops, most small, less wealthy newcomers will still have trouble competing in the fast-paced, capital-intensive portable personal computer market, observers agree. "Most of them don't have much to offer," says NEC's Martin. "They don't have new technologies, the necessary distribution channels, or brand positions. Some of them will fight for the low end of the market, but a lot of them are going nowhere."

Making portables is not like making desktop computers. Expensive injection molds are needed rather than boxlike casings; VLSI technology is necessary to attain the ever-shrinking sizes. "In the desktop arena, there's probably 500 competitors," according to Paul Wagner, national sales manager for Sanyo Business System Corp. "Anyone can buy a box from one company, a disk drive from another and motherboard from a third and put it all together in a garage. But in the laptop industry, you need robotic automation. You can't have a sweatshop operation... That's why only world class players have the ability to stay

in the market long term."

And unlike desktop and other immobile types of computers, first time buyers may be willing to pay for the state-of-the-art technology offered by leading portable computer vendors. "With a desktop, you can choose to have your company pay for a \$1,000 or a \$10,000 machine, depending upon the capabilities you need," says Tandy's Juge. "But with laptops,

The breakneck pace of technological development in portable PCs may be the biggest obstacle to success in this market

you're the guy who has to lug the thing around, the one who has to find an outlet when it starts to run out on you, and the one who has to spring for the extra batteries. It's not just a matter of dollars."

But price is the newcomers' most compelling weapon. "It's true," admits Art Afshar, president of \$24 million Micro Express of Santa Ana, Calif. The company, which will introduce its first battery-powered laptop later this year, expects to undercut market leaders by up to \$2,000 by

relying on yesterday's technology purchased from Japanese manufacturers. "We're always a step behind technologically, but that's good and bad. We don't get the technology until the Japanese have made their money on it, but we know it will work in the marketplace."

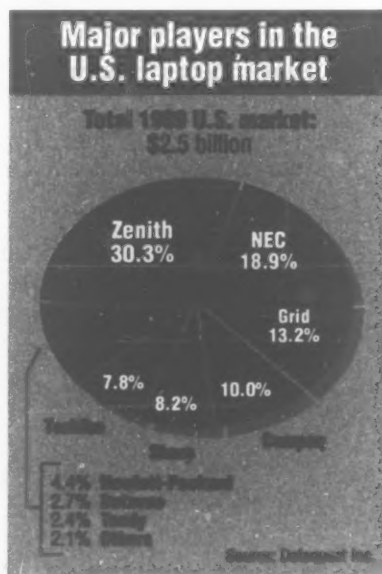
Although the newcomers may shake up the low end of the market, the big-time players will maintain their dominance through 1990. But within that category, there are bound to be some changes. Both Texas Instruments and Apple Computer Inc. have introduced technologically impressive models.

Last fall, TI unveiled two laptops and the LT286 Model 12, a hard-drive equipped notebook model. By announcing it two weeks after the introduction of Compaq's LTE, TI effectively erased what was supposed to be a six-month technological advantage Compaq expected with the LTE.

Jerry Rycaj, TI's terminal marketing manager, believes TI has a major marketing advantage. As a world leader in portable data acquisition tools since 1968, "we already have an installed base." With well-traveled inroads into the *Fortune* 1,000, the company expects to have a 5% market share by year's end, and 10% by 1991.

Apple's long-awaited Macintosh Portable will undoubtedly find willing buyers among Mac enthusiasts. As one Texas Instruments representative put it, "people are going to buy it. They don't have any competition." While its 15.7-pound weight and hefty \$6,969 price tag (with hard drive) defy industry trends, the Portable offers a six- to 12-hour battery life, state-of-the-art graphics, a 16 MHz 68000 microprocessor, a built-in trackball, digital stereo sound capability, and a fully compatible Macintosh interface.

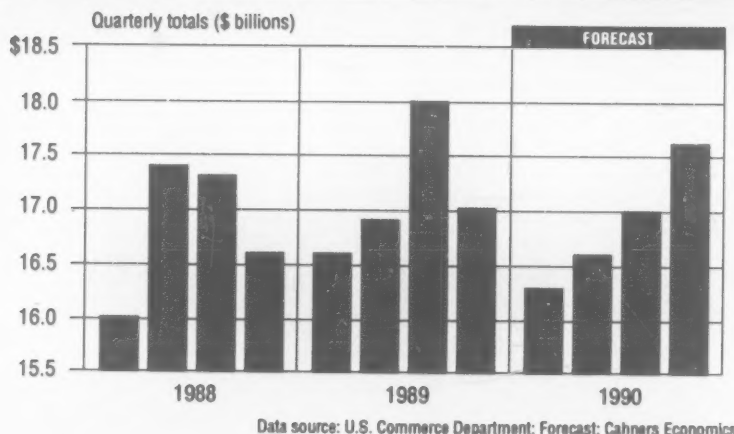
Despite forebodings of a more intensely competitive future, laptop makers are clamoring to ride the tidal wave of demand for portable computers into the 1990s. "We're talking about a full range of users," says Bondwell's Shaffer. "All you need to compete is the dollars, the marketing expertise, and the understanding that you've got to compete with the big guys. And you can't have a mediocre product out there and expect to make it." □



BUSINESS BAROMETER

FORECASTS FOR ELECTRONICS, COMPUTERS AND SYSTEMS

Computer and office equipment new orders



Computer industry gets mild reprieve

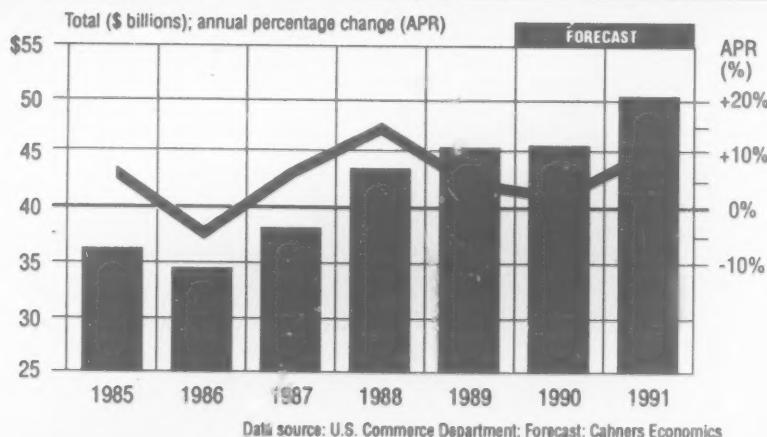
The computer and office equipment sector had a mild reprieve in the third quarter of last year. New orders totaled almost \$18 billion in that period, an increase of 3.8% from the same quarter in 1988. The gain pushed up new orders 6.5% from the poor second quarter showing of \$16.9 billion. Yet, computer manufacturers had better not lull themselves into a false sense of security. The uptick does not imply the turnaround has begun. Cahners Economics forecasts the upswing in the business cycle will start later this year.

Why so? U.S. businesses are still buying new computer equipment, but the rate of growth has dwindled. According to Commerce Department data, U.S. businesses spent \$43.9 billion for computers and office equipment in 1988, a 14% hike from the year before. In 1989, purchases increased an estimated 3.4%. Cahners Economics expects spending to rise just 1% to 2% this year. International sales will help bolster the balance sheets of many computer manufacturers, but even growth in foreign sales won't be as robust in 1990.

Consequently, computer and office equipment shipments will suffer. After growing almost 11% in 1988, shipments squeezed out an estimated gain of 3% last year to total \$69.7 billion. Look for U.S. factory shipments to increase just 1.5% in 1990.

MADELINE FRANCHI

U.S. purchases of computers and office equipment



Computer market database

Latest quarter: 3rd quarter 1989	Latest quarter	Previous quarter	Change	Year ago	Change	Next year	Change
Industrial production (SA, 1977=100, qtr. average)	350.80	351.50	-0.20%	318.97	+9.98%	353.03	+0.64%
Shipments (SA, \$ millions, qtr. total)	\$17,688	\$17,865	-0.99%	\$17,406	+1.62%	\$17,809	+0.69%
New orders (SA, \$ millions, qtr. total)	\$17,959	\$16,870	+6.46%	\$17,306	+3.77%	\$17,006	-5.30%
Unfilled orders (SA, \$ millions, end of qtr.)	\$12,456	\$12,206	+2.05%	\$13,720	-9.21%	\$11,635	-6.59%
Inventory-to-shipment ratio (SA, end of qtr.)	2.07	1.95	—	2.04	—	2.00	—
All employees (thousands, end of qtr.)	475.0	476.9	-0.40%	474.6	+0.08%	466.3	-1.82%
Production workers (thousands, end of qtr.)	157.1	155.0	+1.35%	153.6	+2.28%	154.7	-1.50%
Business purchases (current \$ billions)	\$15.28	\$15.31	-0.20%	\$15.04	+1.60%	\$15.33	+0.33%
Business purchases (1982 \$ billions)	\$42.34	\$41.72	+1.49%	\$39.04	+8.45%	\$44.72	+5.62%

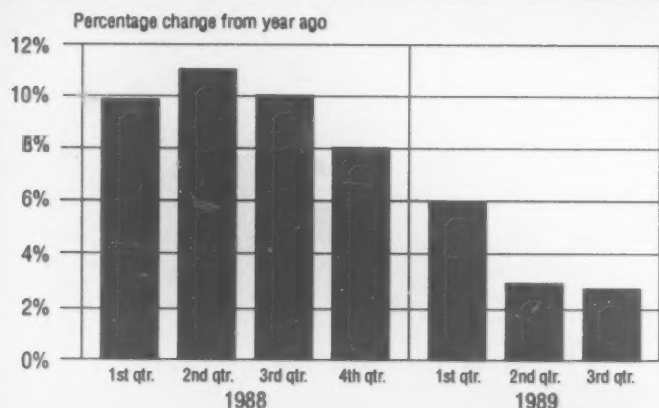
SA = seasonally adjusted; all other data is not seasonally adjusted

Data sources: Federal Reserve Board, U.S. Bureau of the Census and U.S. Bureau of Labor Statistics
All data for SIC 357, except industrial production, SIC 357-9. Forecasts: Cahners Economics

BUSINESS BAROMETER

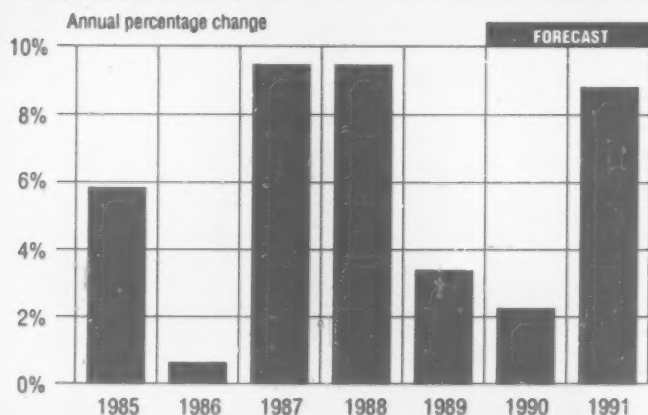
FORECASTS FOR ELECTRONICS, COMPUTERS AND SYSTEMS

Instruments shipments — quarterly growth



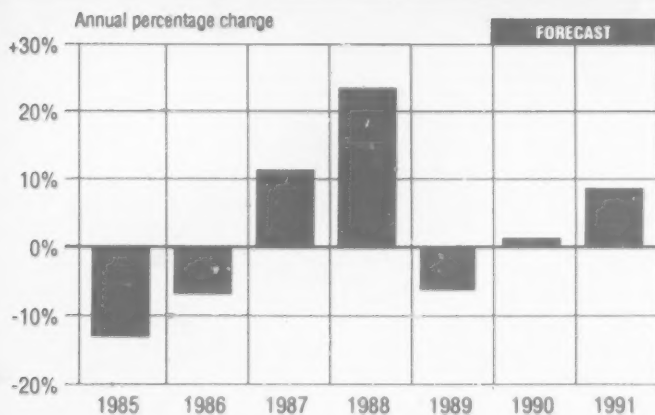
Data source: U.S. Commerce Department

Instruments shipments — annual growth



Data sources: U.S. Commerce Department, Cahners Economics

ATE sales growth



Data source: Electronic Business; Forecast: Cahners Economics

Instruments industry navigates the slowdown

New orders for scientific and engineering instruments edged up 3% in the third quarter of 1989 from a year ago, while shipments climbed 2.8%. The fact that this industry reached its business cycle peak and that growth rates were slowing down has been evident for some time. Since the second quarter of 1988, the quarterly growth rate in shipments has been shrinking. From 11% growth in that quarter, the year-ago growth rate for shipments dwindled to 10% in the third quarter, 8% in the fourth, 6% in the first quarter of 1989, 3% in the second, and only 2.8% recorded in the third quarter of 1989.

Although growth will remain weak, it will not fall into the negative zone so U.S. factory shipments will continue to increase. Shipments will expand by about 2.3% to an annual total of \$51.7 billion in 1990. The preliminary outlook for 1991 is for strong gains of close to 9% in U.S. shipments as business investment picks up after a two-year lull.

Right now the lack of business investment is bothering the instruments industry. In 1988, U.S. business purchased \$15.9 billion worth of instruments, up almost 13% from the prior year. But in 1989, the growth in business purchases of instruments weakened. U.S. business spent an annualized \$16.2 billion for instruments in the third quarter of 1989, a drop of 1.5% compared with the same quarter of 1988. The continuation of this trend meant purchases of instruments for all of 1989 expanded, but at a slower, estimated rate of 4%.

However, the current downturn in the instruments industry will not be as jarring as the previous slump. Inventory remains under tighter control now than in the past and backlogs, at around \$13.3 billion, are slightly above the year-ago level. Even with the comeback in the dollar, foreign sales will help bolster shipments.

As expected, growth rates in the automatic test equipment (ATE) industry turned the corner this past year. The ELECTRONIC BUSINESS ATE sales index dropped 3% in the first quarter compared with a year-ago. Growth dropped off quickly so that by the end of 1989, ATE sales fell an estimated 6%. In 1990, sales are forecast to rise 1.5%. In dollar terms, worldwide ATE sales amounted to \$2.07 billion in 1989 and will increase to \$2.1 billion in 1990.

MADELINE FRANCHI